IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:	Joung et al.	Docket No.:	2003P07969 US
Serial No.:	10/627,844	Confirmation No.:	2648
Filing Date:	7/25/2003	Examiner:	MALEVIC, DJURA
Customer No.:	26474	Art Unit:	2884

For: Registered collimator device for nuclear imaging camera and method of forming the same

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Sir:

Pursuant to the Notice of Appeal filed on January 28, 2008, this is a brief in support of appeal from the final rejection of claims 1 – 28 in the Office action mailed August 27, 2007. Claims 1 – 28 are currently pending and are the subject of this appeal.

The fee of $510.00 set forth in 37 C.F.R. § 41.20(b)(2) is being paid by credit card. Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees, to Deposit Account 14.1437. Please credit any excess fees to such account.

REAL PARTY IN INTEREST:

The real party in interest is Siemens Medical Solutions USA, Inc. of Malvern, Pennsylvania.

RELATED APPEALS AND INTERFERENCES:

To the best of the undersigneds' knowledge, there are no related interferences or judicial proceedings.

STATUS OF CLAIMS:

- Claims 1 – 28 are pending in the application.
- Claims 1 – 28 are rejected.
- No claims are allowed or confirmed.
- No claims are subject to restriction and/or election requirement.
- No claims are withdrawn.
- No claims are objected to.
- No claims are canceled.

STATUS OF AMENDMENTS:

No amendment was filed subsequent to the final rejection mailed August 27, 2007. A reply to the final rejection was filed, but only contained remarks.

SUMMARY OF CLAIMED SUBJECT MATTER:

The invention, as claimed in claim 1, relates to a collimator device for a nuclear imaging camera. This collimator device comprises a grid of collimation square holes formed by a plurality of sheets arranged in a grid pattern (Fig. 1A).[1] Each of these sheets

[1] Specification, page 4, lines 1 – 3.

must have evenly spaced slots into which other sheets are inserted (Fig. 1B).[2] The collimator device further comprises optically reflecting material. The optically reflecting material must coat at least a portion of the surfaces of the sheets forming the grid of the collimation square holes.[3] The collimator further comprises pixellated scintillators individually located in each of said collimation square holes.[4] This arrangement not only allows the reflecting material to provide optical isolation between the pixellated scintillators thereby maximizing the useful output intensity of each scintillator crystal,[5] but also allows for cost-effective fabrication.[6]

The invention, as claimed in claim 10, relates to a scintigraphic device. This scintigraphic device[7] comprises a collimator device[8] including a grid of collimation square holes formed by a plurality of sheets arranged in a grid pattern.[9] Each of the sheets must have evenly spaced slots into which other sheets are inserted.[10] The scintigraphic device further comprises optically reflecting material that coats at least a portion of the surfaces of the sheets forming the grid of the collimation square holes.[11] The scintigraphic device further comprises pixellated scintillators individually located in each of said collimation square holes,[12] and a detector coupled to the pixellated scintillators.[13] The detector must be operable to detect radiation emanating from an object and interacting with the scintillators after passing through the collimator device.[14]

The invention, as claimed in claim 19, relates to a method of forming a collimator device.[15] This method comprises forming a plurality of evenly spaced slots across a longitudinal direction of a plurality of sheets;[16] arranging said plurality of sheets in a grid pattern by inserting a sheet into each of said slots and thereby forming a grid of

[2] Specification, page 4, lines 4 – 5.
[3] Specification, page 4, lines 5 – 7.
[4] Specification, page 4, lines 3 – 4.
[5] Specification, page 6, lines 17 – 19.
[6] Specification, page 8, line 7.
[7] Specification, page 4, line 9.
[8] Specification, page 4, line 9.
[9] Specification, page 4, lines 12 – 13.
[10] Specification, page 4, lines 14 – 15.
[11] Specification, page 4, lines 16 – 17.
[12] Specification, page 4, lines13 – 14.
[13] Specification, page 4, lines 9 – 10.
[14] Specification, page 4, lines 10 – 12.
[15] Specification, page 4, lines 18 – 19.
[16] Specification, page 4, lines 19 – 21.

collimation square holes;[17] coating at least a portion of the surfaces of said sheets forming said grid of said collimation square holes with an optically reflecting material;[18] and inserting pixellated scintillators into each of said collimation square holes.[19] This method allows for cost-effective fabrication.[20] Moreover, since the reflecting material provides optical isolation between the pixellated scintillators, the method results in a collimator device with maximized useful output intensity of each scintillator crystal.[21]

The invention, as claimed in claim 28, relates to a building block for forming a collimator device of a nuclear medical imaging camera.[22] The building block comprises an elongated sheet of metallic material.[23] The elongated sheet of metallic material must have a thickness suitable for functioning as septa of said collimation device.[24] The elongated sheet of metallic material must also have a plurality of evenly spaced slots into which other elongated sheets are inserted in order to form a grid pattern of collimation holes into which pixellated scintillators are placed.[25] Finally, the elongated sheet of metallic material must be coated with an optically reflective material.[26]

The independent claims involved in the appeal are claims 1, 10, 19, and 28. All other claims are dependent on these claims. Summary of the subject matter of the dependent claims is omitted as unnecessary.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

At issue in this appeal is whether the rejection of claims 1 – 28 under 35 U.S.C §103(a) over *Hase et al.* (US 5,099,134) in view of *Tang* (US 5,949,850) and *Nishiki* (US 4,725,734) is in error.

[17] Specification, page 4, lines 21 – 22.
[18] Specification, page 7, lines 26 – 28.
[19] Specification, page 4, line 23.
[20] Specification, page 8, lines 5 – 7.
[21] Specification, page 6, lines 17 – 19.
[22] Specification, page 4, lines 26 – 28.
[23] Specification, page 4, line 28.
[24] Specification, page 4, line 29.
[25] Specification, page 4, line 30 – page 5, line 2.
[26] Specification, page 6, lines 12 – 17.

ARGUMENT:

Appellants respectfully submit that the rejection of claims 1 – 28 under 35 U.S.C §103(a) over *Hase et al.* (US 5,099,134) in view of *Tang* (US 5,949,850) and *Nishiki* (US 4,725,734) is in error. The final rejection proposes to include pixellated scintillators as "taught" by Tang in the collimator device of Hase "in order to construct an integrated grid/scintillator structure hence improving the overall imaging quality." The final rejection further proposes to modify Hase "to include plates coated on both sides with a highly efficient reflector such as that taught by Nishiki in order to construct a collimated structure, which reflects light beams generated form *(sic, from)* the scintillation material, hence improving the overall imaging quality." The alleged motivations to make the proposed modifications are not found from the teachings of the prior art or from the general knowledge of one of ordinary skill in the art, as demonstrated hereinafter.

The *Hase et al.* Reference

Hase discloses a fan-beam focusing collimator, which functions to focus radiation in a converging manner onto a scintillation crystal. The basic elements of the Hase collimator are shown in Figures 1 – 4.

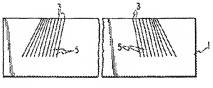


FIG.1

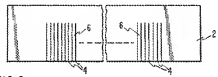


FIG.2

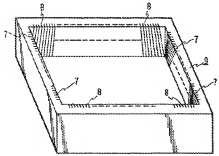


FIG.3

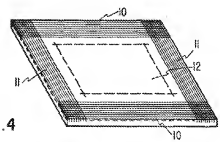


FIG.4

Column 5, lines 27 – 54 of the reference, explains that the collimator is formed by:

- forming a box frame **9** of tungsten or lead alloy;
- forming the guide grooves **7** and **8** in the inner walls of the frame **9**;
- cutting out the end plate **12** of a square shape from an original material of aluminum, which passes radiations; forming the guide grooves **10** and **11**;
- fitting the bottom portions and both end portions of the comb-shaped plates **1** in the guide grooves **7** and **10**;
- fitting the bottom portions and both end portions of the comb-shaped plates **2** in the guide grooves **8** and **11**, while making the slits **4** of the comb-shaped plates and the grooves **3** of the comb-shaped plates **1** to engage with the box-shaped body **13**, crossing one another.

Hase requires a box frame **13** as shown in Figure 5, with walls **9** and radiation transparent bottom frame element **12**, as a necessary structural requirement of the disclosed collimator.

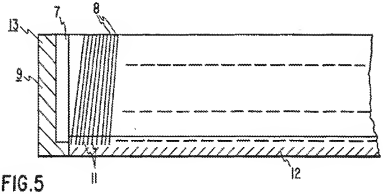


FIG.5

The reference also explains, in column 12, lines 17 – 26, that the box assembling efficiency can be significantly improved by assembling the comb-shaped plates 90 and 91 in separate box frames 110 and 111, which are then connected through positioning pins 112 and positioning holes 113.

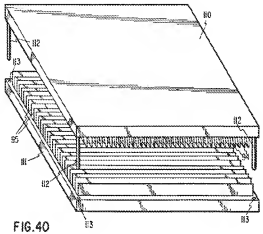


FIG.40

Every aspect of the reference confirms that the collimator of Hase is intended to be used, and in fact must be used, with a conventional scintillation crystal slab. Even the title of the reference, "collimator for a scintillator," makes clear that the reference is intended to be used with a single scintillation crystal slab. As expressed in the Background section in column 1, lines 16 – 22:

> A scinticamera is a device for acquiring … a scintigram. This scinticamera deflects radiation given in a body by a large circular scintillator, a number of photomultiplier tubes, a computer, etc. A honeycomb perforated collimator is provided next to the scintillator to detect radiation from a target organ as much as possible at high sensitivity.[27]

The object of the Hase reference was to provide a new and improved collimator for a conventional scintillation crystal radiation detector. Moreover, the only reason for making the bottom frame **12** radiation transparent (*See* FIG. 4; col. 4, lines 29-30) is to allow radiation to pass through and out of the collimator frame to a scintillation crystal slab positioned adjacent to the collimator. The purpose of the Hase collimator is to focus radiation in a converging manner onto to a scintillation crystal slab. Appellants respectfully submit that there is simply no suggestion or teaching of any other use of the disclosed collimator.

Hase fails to disclose the placement of pixellated scintillators in the holes **15** formed by the partition plates **1** and **2**. More importantly, such placement would be contrary to the purpose of the Hase collimator, which functions to focus radiation in a

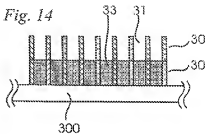
[27] Column 1, lines 16 – 22 of US 5,099,134 (emphasis added).

converging manner onto a scintillation crystal slab; as such Hase further fails to suggest such pixellated scintillators and in fact teaches away from such scintillators.

The *Tang* Reference

Tang is directed to x-ray anti-scatter grids for x-ray imaging. Tang teaches stacking multiple grid layers to provide a focusing grid.

Fig. 14

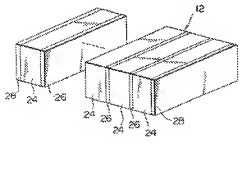


As illustrated in Figure 14, the holes of one or more layers can be filled with an x-ray scintillator or phosphor material **33** so that the device performs the function of anti-scatter x-ray and x-ray scintillator. Tang stresses, however, that "[t]he phosphors should only be in the hole of the bottom layer or bottom layers of the grid stack."[28]

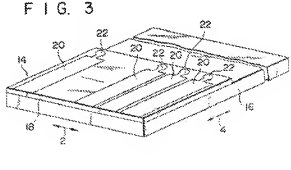
The *Nishiki* Reference

As shown in Figures 2 and 3, Nishiki discloses a radiation-detecting device for computed tomography, wherein a plurality of scintillation elements **24** are linearly arranged with a collimator plate **26** interposed between the respective units thereof; an outermost collimator plate **28** is set outside of each terminal unit of said linearly arranged scintillation elements; the scintillation elements are adhered to the surface of a semiconductor substrate **18** on which a plurality of photodiode elements **14** are mounted.

F I G. 2



F I G. 3



The reference also states, "[t]he collimator plates are coated on both sides with a highly

[28] Column 11, lines 24 – 25 of US 5,949,850 (emphasis added).

efficient reflector to reflect light beams generated from the scintillation element."[29]

The Proposed Combination

Placement of pixellated scintillators in the holes formed by the partition plates of the Hase collimator would be contrary to the purpose of the Hase collimator, which functions to focus radiation in a converging manner onto a scintillation crystal slab. It is well-settled that "[i]f [a] proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification."[30] Thus, from the outset, it should be clear that no apparent reason exists to place pixellated scintillators in the holes formed by the partition plates of the Hase collimator.

Appellants respectfully submit that the proposed combination of Hase and Tang is not practicable. The Office action focuses exclusively on Tang's teaching that the holes of one or more layers can be filled with an x-ray scintillator or phosphor material. This narrow reading of Tang may be convenient to bolster the present rejection, however, it is well-settled that "[a] prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.[31] As a whole, Tang teaches stacking multiple grid layers to provide a focusing grid, and stresses that "phosphors should only be in the hole of the bottom layer or bottom layers of the grid stack."[32] Hase does not involve stacking multiple grid layers. Thus, following the improperly-isolated teaching that holes can be filled with an x-ray scintillator or phosphor material, would not only render the Hase collimator unsatisfactory for its intended purpose, but also violate Tang's teaching that phosphors should only be in the holes of the bottom layer or layers of a grid stack.

Finally, the Hase collimator functions to focus radiation in a converging manner onto a scintillation crystal slab. In other words, Hase requires the scintillation slab to be positioned below the collimator. According to Nishiki, the only reason to coat both sides

[29] Column 3, lines 55 – 58 of US 4,725,734.
[30] MPEP §2143.01, citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).
[31] MPEP §2141.02, citing *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).
[32] Column 11, lines 24 – 25 of US 5,949,850 (emphasis added).

of the collimator plates with a highly efficient reflector is "to reflect light beams generated from the scintillation element."[33] Since Hase requires the scintillation slab to be positioned below the collimator, there is no need to coat the collimator plates with a reflector. Clearly, light beams generated from the scintillation crystal slab positioned below the collimator would not be reflected so as to maximize the output intensity of the scintillation crystal slab. Thus, the combination of Hase and Nishiki would be a non-useful endeavor that would drive up production costs without adding any benefits.

Conclusion

In short, searching for "keywords" disclosed in the present application, for example, "collimator, grid, optically reflecting material, and scintillators," might yield the Hase, Tang and Nishiki references as search results. However, the teachings of Hase, Tang and Nishiki cannot be properly combined to arrive at the present invention. Appellants respectfully submit that the present rejection is in error and should be reversed.

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[33] Column 3, lines 55 – 58 of US 4,725,734.

CLAIMS APPENDIX:

1. (Original) A collimator device for a nuclear imaging camera, comprising:

a grid of collimation square holes formed by a plurality of sheets arranged in a grid pattern, each of said sheets having evenly spaced slots into which other sheets are inserted;

optically reflecting material coating at least a portion of the surfaces of said sheets forming said grid of said collimation square holes; and

pixellated scintillators individually located in each of said collimation square holes.

2. (Original) The device of claim 1, wherein said optically reflecting material maximizes light intensity of pixellated scintillators events.

3. (Original) The device of claim 1, wherein said pixellated scintillators are scintillation crystals.

4. (Original) The device of claim 1, wherein said pixellated scintillators have a square-shaped configuration.

5. (Original) The device of claim 1, wherein said plurality of sheets are formed of a material having a high density.

6. (Original) The device of claim 5, wherein the high density material is tungsten.

7. (Original) The device of claim 5, wherein the high density material is lead.

8. (Original) The device of claim 1, wherein the reflecting material is TiO.sub.2.

9. (Original) The device of claim 1, wherein the reflecting material is MgO.

10. (Original) A scintigraphic device, comprising:

a collimator device including a grid of collimation square holes formed by a plurality of sheets arranged in a grid pattern, each of said sheets having evenly spaced slots into which other sheets are inserted;

optically reflecting material coating at least a portion of the surfaces of said sheets forming said grid of said collimation square holes; and

pixellated scintillators individually located in each of said collimation square holes; and a detector coupled to said pixellated scintillators and operable to detect radiation emanating from an object and interacting with said scintillators after passing through said collimator device.

11. (Original) The device of claim 10, wherein said optically reflecting material maximizes light intensity of pixellated scintillators events.

12. (Original) The device of claim 10, wherein said pixellated scintillators are scintillation crystals.

13. (Original) The device of claim 10, wherein said pixellated scintillators have a square-shaped configuration.

14. (Original) The device of claim 10, wherein said plurality of sheets are formed of a material having a high density.

15. (Original) The device of claim 14, wherein the high density material is tungsten.

16. (Original) The device of claim 14, wherein the high density material is lead.

17. (Original) The device of claim 10, wherein the reflecting material is TiO.sub.2.

18. (Original) The device of claim 10, wherein the reflecting material is MgO.

19. (Original) A method of forming a collimator device, comprising:

forming a plurality of evenly spaced slots across a longitudinal direction of a plurality of sheets;

arranging said plurality of sheets in a grid pattern by inserting a sheet into each of said slots and thereby forming a grid of collimation square holes;

coating at least a portion of the surfaces of said sheets forming said grid of said collimation square holes with an optically reflecting material; and

inserting pixellated scintillators into each of said collimation square holes.

20. (Original) The method of claim 19, wherein said optically reflecting material maximizes light intensity of pixellated scintillators events.

21. (Original) The method of claim 19, wherein said pixellated scintillators are scintillation crystals.

22. (Original) The method of claim 19, wherein said pixellated scintillators have a square-shaped configuration.

23. (Original) The method of claim 19, wherein said plurality of sheets are formed of a material having a high density.

24. (Original) The method of claim 23, wherein the high density material is tungsten.

25. (Original) The method of claim 23, wherein the high density material is lead.

26. (Original) The method of claim 19, wherein the reflecting material is TiO.sub.2.

27. (Original) The method of claim 19, wherein the reflecting material is MgO.

28. (Previously presented) A building block for forming a collimator device of a nuclear medical imaging camera, comprising an elongated sheet of metallic material having a thickness suitable for functioning as septa of said collimation device, having a plurality of evenly spaced slots into which other elongated sheets are inserted in order to form a grid pattern of collimation holes into which pixellated scintillators are placed, and being coated with an optically reflective material.

EVIDENCE APPENDIX:

None.

RELATED PROCEEDINGS AAPPENDIX:

None.